In the Figures

Paragraphs 3 and 4 of the Office Action object to the drawings as failing to comply with 37 C.F.R. 1.84(p)(4); specifically that reference number '81' is used to refer to both "optical surface" and "optical section," and that reference number '191' is used to refer to both "optical surface" and "optical section." The written description has been amended to correct this error such that amending the figures is unnecessary. That is, "optical section 81" is amended to read "optical surface 81" (twice within paragraph [0055]), and "optical section 191" is amended to read "optical surface 191" (twice within paragraph [0067]).

Applicant affirms that the amendments described immediately supra do not include any new matter and are submitted only to more accurately describe the invention.

ARGUMENTS

The Examiner's Rejections

Applicant has noted the Office Action's objection, rejections, and bases for same. For the following reasons, Applicant respectfully submits that the claims as originally filed and the amended claims are in condition for allowance. Applicant respectfully requests that the Examiner consider the arguments and remarks as set forth below and pass the application to issuance.

A. 35 U.S.C. §102(b) Rejections

Claims 47-49, 61 & 62

The Office Action has rejected claims 47-49, 61, and 62 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,733,335 (Serizawa '335). Applicant respectfully traverses these rejections for the following reasons:

The Office Action provides that Serizawa '335 teaches each and every element as claimed in independent claim 47. Specifically, the Office Action provides that Serizawa '335 teaches "a unitary reflector subassembly (as recited in Claim 47), Figure 8, reference number 125" (see paragraph 5 of the Office Action at page 5, lines 10-11; parentheses in original). However, element 125 as shown in Figure 8 of Serizawa '335 is not a reflector, but a lens.[1] The purpose of a lens is to allow at least a portion of light encountering the lens to *pass through* the lens[2]; whereas the purpose of a reflector is to redirect the light

[1] See, for example, column 4, lines 20 and 24 of Serizawa '335 referring to element 125 as: "inner lens 125."

[2] As defined by *Webster's New Twentieth Century Dictionary Unabridged, Second Edition*, a 'lens' is "1. a piece of glass, or other *transparent substance*, with two curved surfaces, or one

encountering the reflector without the light passing through.[3] Specifically, the purpose of inner lens (125) of Serizawa '335 is to allow all light to pass through inner lens[4], which is very different as compared to the function of the unitary reflector subassembly. Thus, Serizawa '335 does not teach or disclose a unitary reflector subassembly.

In addition, the Office Action provides that Serizawa '335 teaches "at least one alignment mechanism (as recited in Claim 47), as evidenced by Figure 8."[5] However, Serizawa '335 does not teach or disclose any sort of alignment mechanism. Moreover, the Office Action is not able to point to any specific language in the specification of Serizawa '335. The Office Action only generally refers to Figure 8. From Applicant's viewing and understanding of Figure 8, an alignment mechanism cannot be seen, nor is one described in the specification. If the Office Action is referring to elements 151, 156, or 157, element 151 is a segregation member, element 156 is an accommodating hole, and element 157 is a reflecting surface, none of which affirmatively align any portion of the lens with an LED, i.e., provide an alignment mechanism.[6] Thus, Serizawa '335 does not teach at least one alignment mechanism.

Therefore, because Serizawa '335 teaches neither a unitary reflector

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plane and one curved, regularly bringing together or spreading rays of light *passing though it*" (italics added).

[3] As defined by *Webster's New Twentieth Century Dictionary Unabridged, Second Edition*, a 'reflector' is "1. a person or thing that reflects; especially, a surface, object, etc. that reflects light, sound, heat or the like," and 'reflect' is defined as "1. to bend or throw back, as light, heat, or sound. 2. to give back an image of; to mirror or reproduce" (italics added).

[4] See column 4, lines 44-45 of Serizawa '335: "The inner lens 125 is preferably made of a *transparent* plastic such as acrylic resin" (italics added).

[5] See paragraph 5 of the Office Action at page 5, lines 21-22; parentheses in original.

subassembly nor at least one alignment mechanism, each and every element of claim 47 is not taught or disclosed by Serizawa '335, making a 35 U.S.C. §102(b) rejection improper. Applicant therefore asserts that claim 47 is patentable.

Finally, claims 48, 49, 61, and 62 depend from claim 47, which Applicant believes has been shown to be patentable. Since these claims depend from an allowable claim, by definition incorporate all of the limitations of claim 47, and add further limitations, it necessarily follows that claims 48, 49, 61, and 62 are necessarily also allowable.

For the aforementioned reasons, Applicant respectfully asserts that claims 47-49, 61, and 62 are in condition for allowance and such allowance is earnestly solicited.

B. 35 U.S.C. §103(a) Rejections

(1) Claims 1-18, 22, 31, 34, 35 & 37-43

The Office Action has rejected claims 1-18, 22, 31, 34, 35, and 37-43 under 35 U.S.C. §103(a) as being anticipated by U.S. Patent No. 4,733,335 (Serizawa '335) in view of U.S. Patent No. 5,851,063 (Doughty '063). Applicant traverses the rejections of claims 1-18, 22, 31, 34, 35, and 37-43 for the following reasons.

The Office Action provides that Serizawa '335 teaches each and every element of independent claim 1, except that the headlamp emits white light in any given direction. Specifically, the Office Action provides that Serizawa '335

[6] See p. 13, lines 18-19 of the clean version of the amended written description of the instant application: the alignment mechanism "align(s) each light transmissive member 17 relative to one (1) light emitting diode (12)."

teaches "all the limitations of the claims except: - the headlamp effectively emanating white light in any given direction (as recited in Claim 1)" (see paragraph 6 of the Office Action at page 13, lines 1-3; parentheses in original). However, as provided supra with respect to the 35 U.S.C. §102(b) rejection, Serizawa '335 does not teach at least one alignment mechanism (as recited in claim 1). The Office Action is not able to point to any specific language in the specifications of Serizawa '335 or Doughty '063 as teaching an alignment mechanism. The Office Action only generally refers to Figure 4 of Serizawa '335.[7] From Applicant's viewing and understanding of Figure 4, an alignment mechanism cannot be seen, nor is one described in the specification of Serizawa '335. If the Office Action is referring to element 208, element 208 is a diode segregation member which does not affirmatively align any portion of the lens with an LED, i.e., does not provide any alignment mechanism.[8] Thus, Serizawa '335 does not teach at least one alignment mechanism.

Therefore, because Serizawa '335 does not teach at least one alignment mechanism, each and every element of claim 1 is not taught or disclosed by Serizawa '335 and/or Doughty '063, making a 35 U.S.C. §102(b) or §103(a) rejection improper. Applicant therefore asserts that claim 1 is patentable.

In the alternative, in the event that the examiner's understanding of Serizawa '335 and Doughty '063 differs from that of Applicant and the Office Action maintains that an alignment mechanism is taught in either of the two

[7] See paragraph 6 of the Office Action at page 8, lines 21-22, which refers to Figure 4 of Serizawa '335 as showing an alignment mechanism.

references, Applicant contends that the combination of Serizawa '335 and Doughty '063 do not render claim 1 of the instant application obvious. As the USPTO recognizes in MPEP §2142, "The examiner bears the initial burden of factually supporting any prima facie conclusion of obviousness. If the examiner does not produce a prima facie case, the applicant is under no obligation to submit evidence of non-obviousness." Thus, the burden rests on the Office Action to show the existence of prima facie obviousness, and if it cannot, the application should be passed to issuance.[9] As will be shown below, the Office Action does not show that prima facie obviousness exists.

There is no basis for modifying Serizawa '335 so that the device of Serizawa '335 would incorporate the differences between it and the apparatus of the instant application. That the Office Action asserts a 35 U.S.C. §103(a) rejection of the application presumes a difference between the invention and Serizawa '335; otherwise a §102 rejection would have been asserted with respect to these claims. The specification of Serizawa '335 does not suggest modifying the embodiments disclosed therein so that the Serizawa '335 device would emanate white light in any given direction.

MPEP §2143.01 provides, "[t]he mere fact that references can be combined or modified does not render the resultant combination (or modification) obvious unless the prior art also suggests the desirability of the combination" or

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[8] See p. 13, lines 18-19 of the clean version of the amended written description: the alignment mechanism "align(s) each light transmissive member 17 relative to one (1) light emitting diode (12)."

[9] See also: "During patent examination the PTO bears the initial burden of presenting a prima facie case of patentability. ... If the PTO fails to meet this burden, then the applicant is entitled to the patent." In re Glaug, 283 F.3d 1335, 1338, 62 USPQ2d 1151, 1152-53 (Fed. Cir. 2002) (citations omitted).

the modification. MPEP §2143.01, citing In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). Thus, obviousness cannot be established absent some teaching, suggestion, or incentive to make the modification, and there is no such teaching, suggestion, or incentive in the prior art to modify Serizawa '335 or Doughty '063. As stated by the Federal Circuit in In re Gordon, "[t]he mere fact that the prior art *could* be so modified would not have made that modification obvious unless the prior art suggested the desirability of the modification." 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984) (italics added).

The Office Action has, therefore, not met its burden of prima facie obviousness with respect to claim 1. For the aforementioned reasons, Applicant respectfully asserts that claim 1 is in condition for allowance and such allowance is earnestly solicited.

With respect to claims 2-18, 22, 31, 34, 35, and 37-43, Applicant contends that these claims depend from claim 1, which Applicant believes has been shown to be patentable. Since these claims depend from an allowable claim, by definition incorporate all of the limitations of claim 1, and add further limitations, it necessarily follows that claims 2-18, 22, 31, 34, 35, and 37-43 are necessarily also allowable.

In addition, claims 8, 12, and 16 recite a unitary reflector subassembly. Neither Serizawa '335 nor Doughty '063 teach a unitary reflector subassembly. Element 125 as shown in Figure 8 of Serizawa '335 is not a reflector, but a lens.[10] The purpose of a lens is to allow at least a portion of light encountering

[10] See, for example, column 4, lines 20 and 24: "inner lens 125."

the lens to *pass through* the lens[11]; whereas the purpose of a reflector is to redirect the light encountering the reflector.[12] Specifically, according to the written description of Serizawa '335, the purpose of inner lens (125) is to allow all light to pass through inner lens[13], which is very different as compared to the function of the unitary reflector subassembly. Thus, Serizawa '335 does not teach or disclose a unitary reflector subassembly, as recited in claims 8, 12, and 16.

For the aforementioned reasons, Applicant respectfully asserts that claims 1-18, 22, 31, 34, 35, and 37-43 are in condition for allowance and such allowance is earnestly solicited.

(2) Claim 19

The Office Action has rejected claim 19 under 35 U.S.C. §103(a) as being anticipated by U.S. Patent No. 4,733,335 (Serizawa '335) in view of U.S. Patent No. 5,851,063 (Doughty '063). Applicant traverses the rejections of claim 19 for the following reasons.

The Office Action provides that Serizawa '335 teaches each and every element of independent claim 1, except that each inner light transmissive member is an aspheric lens. Specifically, the Office Action provides that

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[11] As defined by *Webster's New Twentieth Century Dictionary Unabridged, Second Edition*, a 'lens' is "1. a piece of glass, or other *transparent substance*, with two curved surfaces, or one plane and one curved, regularly bringing together or spreading rays of light *passing though it*" (italics added).

[12] As defined by *Webster's New Twentieth Century Dictionary Unabridged, Second Edition*, a 'reflector' is "1. a person or thing that reflects; especially, a surface, object, etc. that reflects light, sound, heat or the like," and 'reflect' is defined as "1. to bend or throw back, as light, heat, or sound. 2. to give back an image of; to mirror or reproduce" (italics added).

[13] See column 4, lines 44-45: "The inner lens 125 is preferably made of a *transparent* plastic such as acrylic resin" (italics added).

Serizawa '335 teaches:

> "all the limitations of the claims ... except each of the plurality of inner members being an aspheric lens" and that "[i]t would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to use an aspheric lens as the convex lens of SERIZAWA et al. in order to correct for spherical aberration(s) in the light beam outputted by such inner members, and deliver a substantially collimate(d) beam to the outer member, as per the teachings of SERIZAWA" (see paragraph 7 of the Office Action at pages 16-17).

However, as provided supra with respect to the 35 U.S.C. §102(b) rejection, Serizawa '335 does not teach at least one alignment mechanism (as recited in claim 1, from which claim 19 ultimately depends). The Office Action is not able to point to any specific language in the specifications of Serizawa '335 or Doughty '063 as teaching an alignment mechanism. The Office Action only refers to Figure 4 of Serizawa '335[14]. From Applicant's viewing and understanding of Figure 4, as provided supra, an alignment mechanism cannot be seen, nor is one described in the specification of Serizawa '335. If the Office Action is referring to elements 151, 156, or 157, element 151 is a segregation member, element 156 is an accommodating hole, and element 157 is a reflecting surface, none of which affirmatively align any portion of the lens with an LED, i.e., provide an alignment mechanism.[15] Moreover, the Office Action also does not refer to any portion of Doughty '063 that teaches at least one alignment mechanism. Thus, neither Serizawa '335 nor Doughty '063, alone or in combination with one another, teach at least one alignment mechanism.

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[14] See paragraph 7 of the Office Action at page 16, lines 16-18, referring to paragraph 6 of the Office Action, which refers to Figure 4 as showing an alignment mechanism.

Therefore, because neither Serizawa '335 nor Doughty '063 teach at least one alignment mechanism, each and every element of claim 19 is not taught or disclosed by Serizawa '335 and/or Doughty '063, making a 35 U.S.C. §102(b) or §103(a) rejection improper. Applicant therefore asserts that claim 19 is patentable.

In the alternative, in the event that the examiner's understanding of Serizawa '335 and Doughty '063 differs from that of Applicant and the Office Action maintains that an alignment mechanism is taught in either of the two references, Applicant contends that the combination of Serizawa '335 and Doughty '063 do not render claim 19 of the instant application obvious. As the USPTO recognizes in MPEP §2142, "The examiner bears the initial burden of factually supporting any prima facie conclusion of obviousness. If the examiner does not produce a prima facie case, the applicant is under no obligation to submit evidence of non-obviousness." Thus, the burden rests on the Office Action to show the existence of prima facie obviousness, and if it cannot, the application should be passed to issuance.[16] As will be shown below, the Office Action does not show that prima facie obviousness exists.

There is no basis for modifying Serizawa '335 so that the device of Serizawa '335 would incorporate the differences between it and the apparatus of the instant application. That the Office Action asserts a 35 U.S.C. §103(a)

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[15] See p. 13, lines 18-19 of the clean version of the amended written description: the alignment mechanism "align(s) each light transmissive member 17 relative to one (1) light emitting diode (12)."

[16] See also: "During patent examination the PTO bears the initial burden of presenting a prima facie case of patentability. ... If the PTO fails to meet this burden, then the applicant is entitled to the patent." In re Glaug, 283 F.3d 1335, 1338, 62 USPQ2d 1151, 1152-53 (Fed. Cir. 2002) (citations omitted).

rejection of the application presumes a difference between the invention and Serizawa '335; otherwise a §102 rejection would have been asserted with respect to these claims. The specification of Serizawa '335 does not suggest modifying the embodiments disclosed therein so that the Serizawa '335 device would emanate white light in any given direction.

MPEP §2143.01 provides, "[t]he mere fact that references can be combined or modified does not render the resultant combination (or modification) obvious unless the prior art also suggests the desirability of the combination" or the modification. MPEP §2143.01, citing In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). Thus, obviousness cannot be established absent some teaching, suggestion, or incentive to make the modification, and there is no such teaching, suggestion, or incentive in the prior art to modify Serizawa '335 or Doughty '063. As stated by the Federal Circuit in In re Gordon, "[t]he mere fact that the prior art *could* be so modified would not have made that modification obvious unless the prior art suggested the desirability of the modification." 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984) (italics added). The Office Action has, therefore, not met its burden of prima facie obviousness with respect to claim 19.

For the aforementioned reasons, Applicant respectfully asserts that claim 19 is in condition for allowance and such allowance is earnestly solicited.

(3) Claims 32 & 33

The Office Action has rejected claims 32 and 33 under 35 U.S.C. §103(a) as being anticipated by U.S. Patent No. 4,733,335 (Serizawa '335) in view of

U.S. Patent No. 5,851,063 (Doughty '063). Applicant traverses the rejections of claims 32 and 33 for the following reasons.

The Office Action provides that Serizawa '335 teaches each and every element of independent claims 32 and 33, except the specific luminous flux of the LEDs. Specifically, the Office Action provides that Serizawa '335 teaches "all the limitations of the claims ... except the plurality of LED(s) having a minimum luminous flux of approximately 50 lumens (as recited in claim 32) or 70 lumens (as recited in Claim 33)."[17]

As provided supra with respect to the 35 U.S.C. §102(b) rejection, Serizawa '335 does not teach at least one alignment mechanism (as recited in claim 1, from which claims 32 and 33 both depend). The Office Action is not able to point to any specific language in the specifications of Serizawa '335 or Doughty '063 as teaching an alignment mechanism. The Office Action only generally refers to Figures 4 of Serizawa.[18] From Applicant's viewing and understanding of Figure 4, as provided supra, an alignment mechanism cannot be seen, nor is one described in the specification of Serizawa '335. If the Office Action is referring to element 208, element 208 is a diode segregation member, which does not affirmatively align any portion of the lens with an LED, i.e., does not provide an alignment mechanism.[19] Moreover, the Office Action also does not refer to any portion of Doughty '063 that teaches at least one alignment

[17]See paragraph 8 of the Office Action at page 17, lines 7-9

[18] See paragraph 8 of the Office Action at page 17, line 7, which refers to paragraph 6 of the Office Action, which refers to Figure 4 as showing an alignment mechanism.

[19] See p. 13, lines 18-19 of the clean version of the amended written description: the alignment mechanism "align(s) each light transmissive member 17 relative to one (1) light emitting diode (12)."

mechanism. Thus, neither Serizawa '335 nor Doughty '063, alone or in combination with one another, teach at least one alignment mechanism.

Therefore, because neither Serizawa '335 nor Doughty '063 teach at least one alignment mechanism, each and every element of claims 32 and 33 is not taught or disclosed by Serizawa '335 and/or Doughty '063, making a 35 U.S.C. §103(a) rejection improper.

For the aforementioned reasons, Applicant therefore asserts that claims 32 and 33 are patentable and such allowance is earnestly solicited.

(4) Claim 36

The Office Action has rejected claim 36 under 35 U.S.C. §103(a) as being anticipated by U.S. Patent No. 4,733,335 (Serizawa '335) in view of U.S. Patent No. 5,851,063 (Doughty '063). Applicant traverses the rejections of claim 36 for the following reasons.

The Office Action provides that Serizawa '335 teaches each and every element of claim 36, except the material from which the housing is made. Specifically, the Office Action provides that Serizawa '335 and Doughty '063 teach "all the limitations of (claim 36) ... except the housing being constructed of zinc" (see paragraph 9 of the Office Action at page 18). The Office Action continues to read that aluminium and zinc "were art-recognized equivalents at the time the invention was made."[20]

However, the Office Action does not cite to any reference establishing the two materials as equivalent materials. The Office Action refers to paragraphs

[20] See paragraph 9 of the Office Action at page 18, lines 8-9.

0070 and 0074 of the application as filed as teaching that zinc and aluminum are equivalent materials. However, Applicant's reading of these paragraphs does not see any teaching about zinc being the equivalent of aluminum. Rather, the application as filed provides that a die cast zinc housing is only an alternate embodiment of the housing[21] and that aluminum and die cast zinc have similar heat transfer properties,[22] but not that they are equivalents.

According to MPEP 2144.03 (B),

> "[o]rdinarily, there must be some form of evidence in the record to support an assertion of common knowledge. See (*In re*) *Lee*, 277 F.3d (1338) at 1344-45, 61 USPQ2d (1430) at 1434-35 (Fed. Cir. 2002); (*In re*) *Zurko*, 358 F.3d (1379) at at 1386, 59 USPQ2d (1693) at 1697 (holding that general conclusions concerning what is 'basic knowledge' or 'common sense' to one of ordinary skill in the art without specific factual findings and some concrete evidence in the record to support these findings will not support an obvious rejection)."

That is, generalized terms such as "aluminum is an art recognized equivalent of the claimed zinc"[23] or "these two materials were art-recognized equivalents at the time the invention was made"[24] do not satisfy the level of specificity or concrete evidence required for a 35 U.S.C. §103(a) rejection. The Office Action has pointed to no text of Serizawa '335 or of Doughty '063, or to any outside text, treatise, or other authority purporting zinc to be the equivalent of aluminum. Thus, the Office Action has not provided any evidence that zinc is an obvious alternative to aluminum.

In the alternative, in the event that the examiner's reading of Serizawa

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[21] Paragraph 0070 of the instant application.
[22] Paragraph 0074 of the instant application.
[23] See paragraph 9 of the Office Action at page 17, lines 6-7.
[24] See paragraph 9 of the Office Action at page 17, lines 8-9.

'335 with respect to the materials which the housing is made differs from that of Applicant and the Office Action maintains that zinc is the obvious equivalent of aluminum, claim 36 depends from claim 1, which Applicant believes has been shown to be patentable. As provided supra with respect to the 35 U.S.C. §102(b) rejection, Serizawa '335 does not teach at least one alignment mechanism (as recited in claim 1, from which claim 36 ultimately depends). The Office Action is not able to point to any specific language in the specifications of Serizawa '335 or Doughty '063 as teaching an alignment mechanism. The Office Action only generally refers to Figure 4 of Serizawa '335.[25] From Applicant's viewing and understanding of Figure 4, as provided supra, an alignment mechanism cannot be seen, nor is one described in the specification of Serizawa '335. If the Office Action is referring to element 208, element 208 is a diode segregation member, which does not affirmatively align any portion of the lens with an LED, i.e., does not provide an alignment mechanism.[26] Moreover, the Office Action also does not refer to any portion of Doughty '063 that teaches at least one alignment mechanism. Thus, neither Serizawa '335 nor Doughty '063, alone or in combination with one another, teach at least one alignment mechanism, each and every element of claim 36 is not taught or disclosed by Serizawa '335 and/or Doughty '063, making either a 35 U.S.C. §102(b) or §103(a) rejection improper. Thus, since claim 36 depends from an allowable claim, by definition incorporates all of the limitations of claim 1, and adds further limitations, it necessarily follows

[25] See paragraph 9 of the Office Action at page 17, line 2, which refers to paragraph 6 of the Office Action, which refers to Figure 4 of Serizawa '335 as showing an alignment mechanism.

that claim 36 is also allowable.

For the aforementioned reasons, Applicant respectfully asserts that claim 36 is in condition for allowance and such allowance is earnestly solicited.

(5) Claims 44-46

The Office Action has rejected claims 44-46 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,733,335 (Serizawa '335) in view of U.S. Patent No. 5,851,063 (Doughty '063). Applicant traverses the rejections of claims 44-46 for the following reasons:

The Office Action provides that Serizawa '335 teaches each and every element of independent claims 44-46, except the specific function of the lamp. Specifically, the Office Action provides that Serizawa '335 in combination with Doughty '063 teaches

> "all the limitations of the claims ... except the headlamp functioning as one of two low beam headlamps (as recited in Claim 44), one of two high beam headlamps (as recited in Claim 45) ... or one of two combined low beam/high beam headlamps in a dual headlamp assembly (as recited in Claim 46), such headlamp assemblies satisfying the minimum and maximum photometric requirements of the SAE Standards J1383" (see paragraph 10 of the Office Action at page 18, lines 15-20, parentheses in original).

As provided supra with respect to the 35 U.S.C. §102(b) rejection, Serizawa '335 does not teach at least one alignment mechanism, as recited in claim 1, from which claims 44-46 depend. The Office Action is not able to point to any specific language in the specifications of Serizawa '335 or Doughty '063 as teaching an alignment mechanism. The Office Action only refers generally to

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[26] See p. 13, lines 18-19 of the clean version of the amended written description: the alignment mechanism "align(s) each light transmissive member 17 relative to one (1) light emitting diode

Figure 4 of Serizawa '335.[27] From Applicant's viewing and understanding of Figure 4, an alignment mechanism cannot be seen, nor is one described in the specification of Serizawa '335. If the Office Action is referring to element 208, element 208 is a diode segregation member which does not affirmatively align any portion of the lens with an LED, i.e., does not provide an alignment mechanism.[28] Moreover, the Office Action also does not refer to any portion of Doughty '063 that teaches at least one alignment mechanism. Thus, neither Serizawa '335 nor Doughty '063, alone or in combination with one another, teach at least one alignment mechanism.

Furthermore, as the Office Action acknowledges that neither Serizawa '335 nor Doughty '063 teach the headlamp functioning as one of two low beam headlamps (as recited in claim 44), one of two high beam headlamps (as recited in claim 45), or one of two combined low beam/high beam headlamps in a dual headlamp assembly (as recited in claim 46).[29] Rather, the Office Action provides only that one of ordinary skill in the art would consider using the headlamp of the instant application as part of vehicle assembly to satisfy the minimum and maximum photometric requirements of SAE Standards J1383 as being obvious.[30] However, the Office Action does not provide any evidence to establish the

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(12)."

[27] See paragraph 10 of the Office Action, at page 18, lines 16-17, which refer to paragraph 6 of the Office Action, which refers to Figure 4 of Serizawa '335 as showing an alignment mechanism.

[28] See p. 13, lines 18-19 of the clean version of the amended written description: the alignment mechanism "align(s) each light transmissive member 17 relative to one (1) light emitting diode (12)."

[29] See paragraph 10 of the Office Action as being obvious to one of ordinary skill in the art: "satisfying the operational and/or regulatory requirements of a particular application would have flown naturally to one of ordinary skill in the art" (p. 19 of the Office action at lines 12-14).

[30] See paragraph 10 of the Office Action at page 19, lines 1-4.

knowledge of one of ordinary skill in the art.

According to MPEP 2144.03 (B),

> "[o]rdinarily, there must be some form of evidence in the record to support an assertion of common knowledge. See (*In re*) *Lee*, 277 F.3d (1338) at 1344-45, 61 USPQ2d (1430) at 1434-35 (Fed. Cir. 2002); (*In re*) *Zurko*, 358 F.3d (1379) at at 1386, 59 USPQ2d (1693) at 1697 (holding that general conclusions concerning what is 'basic knowledge' or 'common sense' to one of ordinary skill in the art without specific factual findings and some concrete evidence in the record to support these findings will not support an obvious rejection)."

That is, generalized terms such as "it would have been obvious to one of ordinary skill in the art"[31] or "would have flown naturally to one of ordinary skill in the art"[32] do not satisfy the level of specificity or concrete evidence required for a 35 U.S.C. §103(a) rejection.

Therefore, because neither Serizawa '335 nor Doughty '063 teach at least one alignment mechanism, each and every element of claims 44-46 is not taught or disclosed by Serizawa '335 and/or Doughty '063, and because there is no specific or concrete evidence pointed to by the Office Action as to what is well-known in the art at the time of the invention, a 35 U.S.C. §103(a) rejection is improper.

For the aforementioned reasons, Applicant therefore asserts that claims 44-46 are patentable and such allowance is earnestly solicited.

(6) Claim 50

The Office Action has rejected claim 50 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,733,335 (Serizawa '335) in view of the level

of skill of one of ordinary skill in the art. Applicant traverses the rejection of claim 50 for the following reasons.

The Office Action provides that Serizawa '335 "discloses all of the limitations of the claims (*sic*), except the housing being constructed of zinc."[33] Specifically, the Office Action further provides that the two materials are "art-recognized equivalents."[34] However, the Office Action does not cite to any reference establishing the two materials as equivalent materials. The Office Action refers to paragraphs 0070 and 0074 of the application as filed as teaching that zinc and aluminum are equivalent materials. Applicant's reading of these paragraphs does not see any teaching about zinc being the equivalent of aluminum. Rather, the application as filed provides that a die cast zinc housing is only an alternate embodiment of the housing[35] and that aluminum and die cast zinc have similar heat transfer properties,[36] but not that they are equivalents.

According to MPEP 2144.03 (B),

> "[o]rdinarily, there must be some form of evidence in the record to support an assertion of common knowledge. See (*In re*) *Lee*, 277 F.3d (1338) at 1344-45, 61 USPQ2d (1430) at 1434-35 (Fed. Cir. 2002); (*In re*) *Zurko*, 358 F.3d (1379) at at 1386, 59 USPQ2d (1693) at 1697 (holding that general conclusions concerning what is 'basic knowledge' or 'common sense' to one of ordinary skill in the art without specific factual findings and some concrete evidence in the record to support these findings will not support an obvious rejection)."

That is, generalized terms such as "aluminum is an art recognized equivalent of

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[31] See paragraph 10 of the Office Action at page 19, lines 1-2.
[32] See paragraph 10 of the Office Action at page 19, lines 13-14.
[33] See paragraph 11 of the Office Action, at page 21, lines 19-20.
[34] See paragraph 11 of the Office Action at page 22, line 4.
[35] Paragraph 0070 of the instant application.
[36] Paragraph 0074 of the instant application.

the claimed zinc"[37] or "these two materials were art-recognized equivalents at the time the invention was made"[38] do not satisfy the level of specificity or concrete evidence required for a 35 U.S.C. §103(a) rejection. The Office Action has pointed to no text of Serizawa '335, or to any outside text, treatise, or other authority purporting zinc to be the equivalent of aluminum. Thus, the Office Action has not provided any evidence that zinc is an obvious alternative to aluminum.

In the alternative, in the event that the examiner's reading of Serizawa '335 with respect to the materials the housing is made differs from that of Applicant and the Office Action maintains that zinc is the obvious equivalent of aluminum, claim 50 depends from claim 47, which Applicant believes has been shown to be patentable.

As provided supra, Serizawa '335 does not teach at least one alignment mechanism (as recited in claim 47, from which claim 50 depends). The Office Action is not able to point to any specific language in the specifications of Serizawa '335 or Doughty '063 as teaching an alignment mechanism. The Office Action only generally refers to Figure 8 of Serizawa '335.[39] From Applicant's viewing and understanding of Figure 8, as provided supra, an alignment mechanism cannot be seen, nor is one described in the specification of Serizawa '335. If the Office Action is referring to elements 151, 156, or 157, element 151 is a segregation member, element 156 is an accommodating hole, and element 157

[37] See paragraph 11 of the Office Action at page 22, lines 1-2.
[38] See paragraph 11 of the Office Action at page 22, line 4.
[39] See paragraph 11 of the Office Action at page 21, lines 8-9, which only generally refers to Figure 8 as showing an alignment mechanism.

is a reflecting surface, none of which affirmatively align any portion of the lens with an LED, i.e., does not provide an alignment mechanism.[40] Thus, Serizawa '335 does not teach at least one alignment mechanism.

In addition, Serizawa '335 also does not teach a unitary reflector subassembly (as recited in claim 47, from which claim 50 depends). The Office Action provides that a unitary reflector subassembly is shown in Figure 8, reference number 125.[41] Element 125 as shown in Figure 8 of Serizawa '335 is not a reflector, but a lens.[42] The purpose of a lens is to allow at least a portion of light encountering the lens to *pass through* the lens[43]; whereas the purpose of a reflector is to redirect the light encountering the reflector.[44] Specifically, according to the written description of Serizawa '335, the purpose of inner lens (125) is to allow all light to pass through inner lens[45], which is very different as compared to the function of the unitary reflector subassembly. Thus, Serizawa '335 does not teach or disclose a unitary reflector subassembly.

Thus, Serizawa '335 does not teach at least one alignment mechanism or a unitary reflector subassembly, which are elements of claim 50 because it

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[40] See p. 13, lines 18-19 of the clean version of the amended written description: the alignment mechanism "align(s) each light transmissive member 17 relative to one (1) light emitting diode (12)."

[41] See paragraph 11 of the Office Action at page 20, lines 15-16.

[42] See, for example, column 4, lines 20 and 24 of Serizawa '335 referring to element 125 as: "inner lens 125."

[43] As defined by *Webster's New Twentieth Century Dictionary Unabridged, Second Edition*, a 'lens' is "1. a piece of glass, or other *transparent substance*, with two curved surfaces, or one plane and one curved, regularly bringing together or spreading rays of light *passing though it*" (italics added).

[44] As defined by *Webster's New Twentieth Century Dictionary Unabridged, Second Edition*, a 'reflector' is "1. a person or thing that reflects; especially, a surface, object, etc. that reflects light, sound, heat or the like," and 'reflect' is defined as "1. to bend or throw back, as light, heat, or sound. 2. to give back an image of; to mirror or reproduce" (italics added).

[45] See column 4, lines 44-45 of Serizawa: "The inner lens 125 is preferably made of a *transparent* plastic such as acrylic resin" (italics added).

depends from claim 47. Consequently, each and every element of claim 50 is not taught or disclosed by Serizawa '335, making both a 35 U.S.C. §102(b) or §103(a) rejection improper. In addition, since claim 50 depends from an allowable claim, by definition incorporates all of the limitations of claim 47, and adds further limitations, it necessarily follows that claim 50 is also allowable.

For the aforementioned reasons, Applicant respectfully asserts that claim 50 is in condition for allowance and such allowance is earnestly solicited.

(7) Claim 51

The Office Action has rejected claim 51 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,733,335 (Serizawa '335) in view of the level of skill of one of ordinary skill in the art. Applicant traverses the rejection of claim 51 for the following reasons.

The Office Action provides that Serizawa '335 "discloses all of the limitations of the claims (*sic*), except each of the plurality of inner members being an aspheric lens."[46] Specifically, the Office Action further provides that "It would have been obvious to one of ordinary skill in the art ... to use an aspheric lens ... as the convex lens of SERIZAWA et al."[47] However, the Office Action does not cite to any reference establishing the state of the art regarding the interchangability of an aspheric lens for a convex lens. The Office Action only refers to column 4, lines 65-68 and column 5, lines 1-5 of Serizawa '335 as evidence that because the purpose of the lens assembly of Serizawa '335 is known, that use of an aspheric lens would be obvious. Applicant's reading of

[46] See paragraph 12 of the Office Action, at page 24, lines 10-11.

these paragraphs does not see any teaching about an aspheric lens being the equivalent of a convex lens.

Moreover, the Office Action has not pointed to any outside text, treatise, or other authority purporting an aspheric lens to be the equivalent of a convex lens. According to MPEP 2144.03 (B),

> "[o]rdinarily, there must be some form of evidence in the record to support an assertion of common knowledge. See (*In re*) *Lee*, 277 F.3d (1338) at 1344-45, 61 USPQ2d (1430) at 1434-35 (Fed. Cir. 2002); (*In re*) *Zurko*, 358 F.3d (1379) at at 1386, 59 USPQ2d (1693) at 1697 (holding that general conclusions concerning what is 'basic knowledge' or 'common sense' to one of ordinary skill in the art without specific factual findings and some concrete evidence in the record to support these findings will not support an obvious rejection)."

That is, generalized terms such as "it would have been obvious"[48] do not satisfy the level of specificity or concrete evidence required for a 35 U.S.C. §103(a) rejection. Thus, the Office Action has not provided any evidence that a convex lens is an obvious alternative to an aspheric lens.

In addition, an "aspheric lens" is one in which the lens varies slightly from sphericity and has only a slight aberration[49], whereas a convex lens is one in the lens' surface curves or bulges outward.[50] That is, "aspheric" defines the degree to which a lens varies from perfect, whereas "convex" defines the overall shape of the lens. Thus, not only does Serizawa '335 not teach that an aspheric lens is interchangeable with a convex lens, the two terms define different characteristics

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[47] See paragraph 12 of the Office Action at page 24, lines 12-14.
[48] See paragraph 12 of the Office Action at page 24, line 12.
[49] See Dictionary.com definition of 'aspheric': "Varying slightly from sphericity and having only slight aberration, as a lens."
[50] See Dictionary.com definition of 'convex': "Having a surface or boundary that curves or bulges outward, as the exterior of a sphere," and *Webster's New Twentieth Century Dictionary Unabridged, Second Edition*, defining 'convex' as "having a surface that curves outward."

of a lens. Thus, a lens can be aspheric with or without being convex, and a lens can be convex with or without being aspheric.[51]

In the alternative, in the event that the examiner's reading of Serizawa '335 with respect to the interchangability of an aspheric and convex lens differs from that of Applicant and the Office Action maintains that an aspheric lens is the obvious equivalent of a convex lens, claim 51 depends from claim 47, which Applicant believes has been shown to be patentable. As provided supra, Serizawa '335 does not teach at least one alignment mechanism (as recited in claim 47 (from which claim 51 depends). The Office Action is not able to point to any specific language in the specification of Serizawa '335 as teaching an alignment mechanism. The Office Action only generally refers to Figure 8 of Serizawa '335.[52] From Applicant's viewing and understanding of Figure 8, as provided supra, an alignment mechanism cannot be seen, nor is one described in the specification of Serizawa '335. If the Office Action is referring to elements 151, 156, or 157, element 151 is a segregation member, element 156 is an accommodating hole, and element 157 is a reflecting surface, none of which affirmatively align any portion of the lens with an LED, i.e., provide an alignment mechanism.[53] Thus, Serizawa '335 does not teach at least one alignment mechanism.

In addition, Serizawa '335 does not teach a unitary reflector subassembly (as recited in claim 47, from which claim 51 depends). The Office Action

[51] That is, this is comparing the proverbial apples to oranges.
[52] See paragraph 12 of the Office Action at page 23, lines 17-18.

provides that a unitary reflector subassembly is shown in Figure 8, reference number 125.[54] Element 125 as shown in Figure 8 of Serizawa '335 is not a reflector, but a lens.[55] The purpose of a lens is to allow at least a portion of light encountering the lens to *pass through* the lens[56]; whereas the purpose of a reflector is to redirect the light encountering the reflector.[57] Specifically, according to the written description of Serizawa '335, the purpose of inner lens (125) is to allow all light to pass through inner lens[58], which is very different as compared to the function of the unitary reflector subassembly. Thus, Serizawa '335 does not teach or disclose a unitary reflector subassembly.

Thus, Serizawa '335 does not teach at least one alignment mechanism or a unitary reflector subassembly, which are elements of claim 51 because it depends from claim 47. Consequently, each and every element of claim 51 is not taught or disclosed by Serizawa '335, making both a 35 U.S.C. §102(b) or §103(a) rejection improper.

In addition, because claim 51 depends from an allowable claim, by definition incorporates all of the limitations of claim 47, and adds further

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[53] See p. 13, lines 18-19 of the clean version of the amended written description: the alignment mechanism "align(s) each light transmissive member 17 relative to one (1) light emitting diode (12)."

[54] See paragraph 12 of the Office Action at page 23, lines 6-7.

[55] See, for example, column 4, lines 20 and 24 of Serizawa '335 referring to element 125 as: "inner lens 125."

[56] As defined by *Webster's New Twentieth Century Dictionary Unabridged, Second Edition*, a 'lens' is "1. a piece of glass, or other *transparent substance*, with two curved surfaces, or one plane and one curved, regularly bringing together or spreading rays of light *passing though it*" (italics added).

[57] As defined by *Webster's New Twentieth Century Dictionary Unabridged, Second Edition*, a 'reflector' is "1. a person or thing that reflects; especially, a surface, object, etc. that reflects light, sound, heat or the like," and 'reflect' is defined as "1. to bend or throw back, as light, heat, or sound. 2. to give back an image of; to mirror or reproduce" (italics added).

[58] See column 4, lines 44-45: "The inner lens 125 is preferably made of a *transparent* plastic such as acrylic resin" (italics added).

limitations, it necessarily follows that claim 51 is also allowable.

For the aforementioned reasons, Applicant respectfully asserts that claim 51 is in condition for allowance and such allowance is earnestly solicited.

(8) Claims 52, 53 & 63-65

The Office Action has rejected claims 52, 53, and 63-65 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,733,335 (Serizawa '335) in view of the level of skill of one of ordinary skill in the art. Applicant traverses the rejection of claims 52, 53, and 63-65 for the following reasons.

The Office Action provides that Serizawa '335 "discloses all of the limitations of the claims, except the LEDs and corresponding reflectors being arranged in two rows of three (claim 52), the reflector subassembly being constructed of a metalized thermoplastic material (claim 53), the specific dimensions of the assembly or that the assembly is a quad headlamp assembly (claim 63), that the outer member and housing are generally circular (claim 64), and that the assembly is seven (7) inches round and is a combined high/low beam, sealed-beam headlamp for a dual headlamp assembly (claim 65).[59]

Claims 52, 53, and 63-65 all depend ultimately from claim 47, which Applicant believes has been shown to be patentable. As provided supra, Serizawa '335 does not teach at least one alignment mechanism (as recited in claim 47). The Office Action is not able to point to any specific language in the specification of Serizawa '335 as teaching an alignment mechanism. The Office

[59] See paragraph 13 of the Office Action at page 27, lines 4-16.

Action only generally refers to Figure 8 of Serizawa '335.[60] From Applicant's viewing and understanding of Figure 8, as provided supra, an alignment mechanism cannot be seen, nor is one described in the specification of Serizawa '335. If the Office Action is referring to elements 151, 156, or 157, element 151 is a segregation member, element 156 is an accommodating hole, and element 157 is a reflecting surface, none of which affirmatively align any portion of the lens with an LED, i.e., provide an alignment mechanism.[61] Thus, Serizawa '335 does not teach at least one alignment mechanism.

In addition, Serizawa '335 does not teach a unitary reflector subassembly (as recited in claim 47). The Office Action provides that a unitary reflector subassembly is shown in Figure 8, reference number 125.[62] Element 125 as shown in Figure 8 of Serizawa '335 is not a reflector, but a lens.[63] The purpose of a lens is to allow at least a portion of light encountering the lens to *pass through* the lens[64]; whereas the purpose of a reflector is to redirect the light encountering the reflector.[65] Specifically, according to the written description of Serizawa '335, the purpose of inner lens (125) is to allow all light to pass through

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[60] See paragraph 13 of the Office Action at page 26, lines 8-9, which refers to paragraph 6 of the Office Action, which refers to Figure 8 of Serizawa '335 as showing an alignment mechanism.

[61] See p. 13, lines 18-19 of the clean version of the amended written description: the alignment mechanism "align(s) each light transmissive member 17 relative to one (1) light emitting diode (12)."

[62] See paragraph 13 of the Office Action at page 25, lines 19-20.

[63] See, for example, column 4, lines 20 and 24: "inner lens 125."

[64] As defined by *Webster's New Twentieth Century Dictionary Unabridged, Second Edition*, a 'lens' is "1. a piece of glass, or other *transparent substance*, with two curved surfaces, or one plane and one curved, regularly bringing together or spreading rays of light *passing though it*" (italics added).

[65] As defined by *Webster's New Twentieth Century Dictionary Unabridged, Second Edition*, a 'reflector' is "1. a person or thing that reflects; especially, a surface, object, etc. that reflects light, sound, heat or the like," and 'reflect' is defined as "1. to bend or throw back, as light, heat, or sound. 2. to give back an image of; to mirror or reproduce" (italics added).

inner lens[66], which is very different as compared to the function of the unitary reflector subassembly. Thus, Serizawa '335 does not teach or disclose a unitary reflector subassembly.

Thus, Serizawa '335 does not teach at least one alignment mechanism nor a unitary reflector subassembly, which are elements of claims 52, 53, and 63-65 because each ultimately depends from claim 47. Consequently, each and every element of claims 52, 53, and 63-65 is not taught or disclosed by Serizawa '335 and/or the skill of one of ordinary skill in the art, making both a 35 U.S.C. §102(b) or §103(a) rejection improper.

In addition, because claims 52, 53, and 63-65 depend from an allowable claim, each by definition incorporates all of the limitations of claim 47, and each adds further limitations, it necessarily follows that claims 52, 53, and 63-65 are also allowable.

For the aforementioned reasons, Applicant respectfully asserts that claims 52, 53, and 63-65 are in condition for allowance and such allowance is earnestly solicited.

(9) Claims 59 & 60

The Office Action has rejected claims 59 and 60 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,733,335 (Serizawa '335) in view of the level of skill of one of ordinary skill in the art. Specifically, the Office Action provides that Serizawa '335 discloses all of the limitations of the claims, except the LEDs having a minimum luminous flux of 50 lumens (claim 59) or 70 lumens

[66] See column 4, lines 44-45: "The inner lens 125 is preferably made of a *transparent* plastic

(claim 60). Applicant traverses the rejection of claims 59 and 60 for the following reasons.

Claims 59 and 60 each depend from claim 47, which Applicant believes has been shown to be patentable. As provided supra, Serizawa '335 does not teach at least one alignment mechanism (as recited in claim 47). The Office Action is not able to point to any specific language in the specifications of Serizawa '335 as teaching an alignment mechanism. The Office Action only generally refers to Figure 8 of Serizawa '335.[67] From Applicant's viewing and understanding of Figure 8, as provided supra, an alignment mechanism cannot be seen, nor is one described in the specification of Serizawa '335. If the Office Action is referring to elements 151, 156, and 157, element 151 is a segregation member, element 156 is an accommodating hole, and element 157 is a reflecting surface, none of which affirmatively align any portion of the lens with an LED, i.e., provide an alignment mechanism.[68] Thus, Serizawa '335 does not teach an alignment mechanism. In addition, the Office Action also does not refer to any other reference that teaches at least one alignment mechanism.

In addition, Serizawa '335 does not teach a unitary reflector subassembly (as recited in claim 47). The Office Action provides that a unitary reflector subassembly is shown in Figure 8, reference number 125.[69] Element 125 as

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such as acrylic resin" (italics added).

[67] See paragraph 14 of the Office Action at page 31, lines 8-9, which refers to Figure 8 of Serizawa '335 as showing an alignment mechanism.

[68] See p. 13, lines 18-19 of the clean version of the amended written description: the alignment mechanism "align(s) each light transmissive member 17 relative to one (1) light emitting diode (12)."

[69] See paragraph 14 of the Office Action at page 30, lines 17-18.

shown in Figure 8 of Serizawa '335 is not a reflector, but a lens.[70] The purpose of a lens is to allow at least a portion of light encountering the lens to *pass through* the lens[71]; whereas the purpose of a reflector is to redirect the light encountering the reflector.[72] Specifically, according to the written description of Serizawa '335, the purpose of inner lens (125) is to allow all light to pass through inner lens[73], which is very different as compared to the function of the unitary reflector subassembly. Thus, Serizawa '335 does not teach or disclose a unitary reflector subassembly.

Thus, Serizawa '335 does not teach at least one alignment mechanism or a unitary reflector subassembly, which are elements of claims 59 and 60 because each depends from claim 47. Consequently, each and every element of claims 59 and 60 is not taught or disclosed by Serizawa '335 and/or the skill of one of ordinary skill in the art, making both a 35 U.S.C. §102(b) or §103(a) rejection improper.

In addition, because claims 59 and 60 depend from an allowable claim, each by definition incorporates all of the limitations of claim 47, and each adds further limitations, it necessarily follows that claims 59 and 60 are also allowable.

For the aforementioned reasons, Applicant respectfully asserts that claims

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[70] See, for example, column 4, lines 20 and 24 of Serizawa '335 referring to element 125 as: "inner lens 125."

[71] As defined by *Webster's New Twentieth Century Dictionary Unabridged, Second Edition*, a 'lens' is "1. a piece of glass, or other *transparent substance*, with two curved surfaces, or one plane and one curved, regularly bringing together or spreading rays of light *passing though it*" (italics added).

[72] As defined by *Webster's New Twentieth Century Dictionary Unabridged, Second Edition*, a 'reflector' is "1. a person or thing that reflects; especially, a surface, object, etc. that reflects light, sound, heat or the like," and 'reflect' is defined as "1. to bend or throw back, as light, heat, or sound. 2. to give back an image of; to mirror or reproduce" (italics added).

59 and 60 are in condition for allowance and such allowance is earnestly solicited.

(10) Claims 66-68

The Office Action has rejected claims 66-68 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,733,335 (Serizawa '335) in view of the level of skill of one of ordinary skill in the art. Specifically, the Office Action provides that Serizawa '335 "discloses all of the limitations of the claims, except the headlamp functioning as one of two low beam headlamps (claim 66), functioning one of two high beam headlamps (claim 67), or functioning one of two combined low beam/high beam headlamps in a dual headlamp assembly (claim 68), and satisfying SAE Standards J1383 minimum and maximum photometric requirements.[74] Applicant traverses the rejection of claims 66-68 for the following reasons.

Claims 66-68 each depend from claim 47, which Applicant believes has been shown to be patentable. As provided supra, Serizawa '335 does not teach at least one alignment mechanism (as recited in claim 47). The Office Action is not able to point to any specific language in the specifications of Serizawa '335 or Doughty '063 as teaching an alignment mechanism. The Office Action only generally refers to Figure 8 of Serizawa '335.[75] From Applicant's viewing and understanding of Figure 8, as provided supra, an alignment mechanism cannot

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[73] See column 4, lines 44-45: "The inner lens 125 is preferably made of a *transparent* plastic such as acrylic resin" (italics added).
[74] See paragraph 15 of the Office Action, at page 34, lines 15-20.
[75] See paragraph 15 of the Office Action, at page 34, lines 1-2, which refers to Figure 8 of Serizawa '335 as showing an alignment mechanism.

be seen, nor is one described in the specification of Serizawa '335. If the Office Action is referring to elements 151, 156, and 157, element 151 is a segregation member, element 156 is an accommodating hole, and element 157 is a reflecting surface, none of which affirmatively align any portion of the lens with an LED, i.e., provide an alignment mechanism.[76] Thus, Serizawa '335 does not teach at least one alignment mechanism.

In addition, Serizawa '335 does not teach a unitary reflector subassembly (as recited in claim 47). The Office Action provides that a unitary reflector subassembly is shown in Figure 8, reference number 125.[77] Element 125 as shown in Figure 8 of Serizawa '335 is not a reflector, but a lens.[78] The purpose of a lens is to allow at least a portion of light encountering the lens to *pass through* the lens[79]; whereas the purpose of a reflector is to redirect the light encountering the reflector.[80] Specifically, according to the written description of Serizawa '335, the purpose of inner lens (125) is to allow all light to pass through inner lens[81], which is very different as compared to the function of the unitary

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[76] See p. 13, lines 18-19 of the clean version of the amended written description: the alignment mechanism "align(s) each light transmissive member 17 relative to one (1) light emitting diode (12)."

[77] See paragraph 15 of the Office Action at page 33, lines 12-13.

[78] See, for example, column 4, lines 20 and 24 of Serizawa '335 referring to element 125 as: "inner lens 125."

[79] As defined by *Webster's New Twentieth Century Dictionary Unabridged, Second Edition*, a 'lens' is "1. a piece of glass, or other *transparent substance*, with two curved surfaces, or one plane and one curved, regularly bringing together or spreading rays of light *passing though it*" (italics added).

[80] As defined by *Webster's New Twentieth Century Dictionary Unabridged, Second Edition*, a 'reflector' is "1. a person or thing that reflects; especially, a surface, object, etc. that reflects light, sound, heat or the like," and 'reflect' is defined as "1. to bend or throw back, as light, heat, or sound. 2. to give back an image of; to mirror or reproduce" (italics added).

[81] See column 4, lines 44-45: "The inner lens 125 is preferably made of a *transparent* plastic such as acrylic resin" (italics added).

reflector subassembly. Thus, Serizawa '335 does not teach or disclose a unitary reflector subassembly.

Thus, Serizawa '335 teaches neither at least one alignment mechanism nor a unitary reflector subassembly, which are elements of claims 66-68 because it depends from claim 47. Consequently, each and every element of claims 66-68 is not taught or disclosed by Serizawa '335, making both a 35 U.S.C. §102(b) or §103(a) rejection improper.

In addition, because claims 66-68 each depend from an allowable claim, each by definition incorporates all of the limitations of claim 47, and each adds further limitations, it necessarily follows that claims 66-68 are also allowable.

For the aforementioned reasons, Applicant respectfully asserts that claims 66-68 are in condition for allowance and such allowance is earnestly solicited.

(11) Claim 72

The Office Action has rejected claim 72 under 35 U.S.C. §103(a) as being unpatentable over by U.S. Patent No. 4,733,335 (Serizawa '335) in view of the level of skill of one of ordinary skill in the art. Specifically, the Office Action provides that Serizawa '335 teaches "all the limitations of the claim, except the assembly including two headlamps"[82] and that "(i)t would have been obvious to one of ordinary skill in the art ... to include two lamps in the assembly of SERIZAWA et al."[83]

Applicant respectfully asserts that amended claim 72 is in condition for allowance and such allowance is earnestly solicited.

(12) Claims 73 & 79

The Office Action has rejected claims 73 and 79 under 35 U.S.C. §103(a) as being unpatentable over by U.S. Patent No. 4,733,335 (Serizawa '335) in view of the level of skill of one of ordinary skill in the art. Specifically, the Office Action provides that Serizawa '335 teaches "all the limitations of the claims, ... except the illumination assembly including two low beam headlamps and two high beam headlamps (as recited in Claim 73), or two combined low beam/high beam headlamps (as recited in Claim 79)."[84]

Claims 73 and 79 depend from claim 72, which Applicant believes has been amended to be patentable. Since these claims depend from an allowable claim, by definition incorporate all of the limitations of claim 72, and add further limitations, it necessarily follows that claims 73 and 79 are necessarily also allowable.

For the aforementioned reasons, Applicant respectfully asserts that claims 73 and 79 are in condition for allowance and such allowance is earnestly solicited.

(13) Claim 80

The Office Action has rejected claim 80 under 35 U.S.C. §103(a) as being unpatentable over by U.S. Patent No. 4,733,335 (Serizawa '335) in view of the level of skill of one of ordinary skill in the art. Specifically, the Office Action provides that Serizawa '335 teaches "all the limitations of the claims, ... except

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[82] See paragraph 16 of the Office Action, at page 36, lines 20-21.
[83] See paragraph 16 of the Office Action, at page 37, lines 1-2.
[84] See paragraph 17 of the Office Action, at page 37, lines 11-13.

the illumination assembly satisfying the minimum and maximum photometric requirements of the SAE Standards J1383 (as recited in Claim 80)."[85]

Claim 80 depends from claim 72, which Applicant believes has been amended to be patentable. Since these claims depend from an allowable claim, by definition incorporate all of the limitations of claim 72, and add further limitations, it necessarily follows that claim 80 is necessarily also allowable.

For the aforementioned reasons, Applicant respectfully asserts that claim 80 is in condition for allowance and such allowance is earnestly solicited.

[85] See paragraph 18 of the Office Action, at page 38, lines 7-10.

Comments on Statement of Reasons for Allowance

Applicant objects to the statement of reasons for the indication of allowable subject matter at page 40 of the Office Action. Applicant objects on the grounds that a statement of reasons for allowance is not necessary because the record of the prosecution as a whole makes clear the reasons for allowance. *See* 37 C.F.R. §1.104 (stating if "the record of the prosecution as a whole does not make clear [the examiner's] reasons for allowing [the] claims, the examiner may set forth such reasoning"); MPEP §1302.14. Therefore, because the file history speaks for itself, Applicant respectfully submits that the statement of reasons for allowance is unnecessary and should be withdrawn from the file history.

Moreover, Applicant sets forth that the Examiner's recitation of the reasons for allowance does not add any substance to the file history but merely places unwarranted interpretations, not expressed by the Applicant, upon the claims. *See* MPEP §1302.14 stating that "care must be taken to ensure that statements of reasons for allowance (or indication of allowable subject matter) are accurate, precise and do not place unwarranted interpretations, whether broad or narrow, upon the claims" (Emphasis added). Therefore, Applicant respectfully submits that the statement of reasons for allowance be withdrawn from the file history.

In the alternative, Applicant respectfully submits that the statement of reasons for allowance be amended as set forth below.

REASONS FOR ALLOWANCE

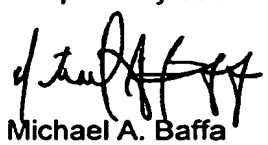
The primary reason for the allowance of the claims is that the prior art fails to show or suggest a light emitting diode headlamp capable of low beam and high beam functions comprising high-flux light emitting diodes, a reflector subassembly, a first and second light transmissive member, and a heat sink.

Remarks

In view of the foregoing discussion, it is respectfully submitted that amended claims 1-80 are in condition for allowance, and such allowance is earnestly solicited. It is further respectfully submitted that the amended title, the amendments to the abstract, and the amendments to the written description overcome the objections to the title, abstract, and figures, respectively. It is still further submitted that the additional amendments to the written description do not add any new matter, but are only to more clearly describe embodiments of the invention.

Date: July 1, 2005

Respectfully submitted,



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[LIGHT EMITTING DIODE HEADLAMP AND HEADLAMP ASSEMBLY] "Light Emitting Diode Headlamp"

PRIORITY CLAIM

[0001] The present application claims priority to U.S. Provisional Patent Application, Serial Number 60/414,980, filed October 1, 2002, and U.S. Provisional Patent Application, Serial Number 60/507,621, filed September 30, 2003, both of which are incorporated by reference herein in their entireties.

FIELD OF THE INVENTION

[0002] The subject invention relates to vehicular lights. More particularly, the embodiments of the subject invention are directed to a headlamp and headlamp assembly for vehicles that uses light emitting diodes as a light source.

BACKGROUND OF THE INVENTION

[0003] Most motorized vehicles currently use incandescent or high-intensity discharge sealed-beam headlamps and headlamp assemblies. The embodiments of the subject invention are designed to retrofit the current incandescent sealed-beam headlamps and headlamp assemblies. For example, many heavy-duty vehicles use four (4) inch by six (6) inch, rectangular, sealed-beam headlamps in a quad lamp assembly. In one embodiment of the present invention, four (4) inch by six (6) inch, rectangular, sealed-beam low beam and high beam headlamps, that use light emitting

diodes as a light source, form a quad lamp assembly designed to retrofit the incandescent four (4) inch by six (6) inch quad packages. By way of further example, other vehicles use seven (7) inch round, sealed-beam headlamps in a dual lamp assembly. Therefore, in an alternate embodiment of the invention, seven (7) inch round, sealed-beam combined low/high beam headlamps, that use light emitting diodes as a light source, form a two-lamp assembly designed to retrofit the incandescent, seven (7) inch round packages.

[0004] The embodiments of the subject invention that are disclosed herein are designed to satisfy the Society of Automotive Engineers (SAE) Standard J1383 for high beam and low beam vehicular headlamps. SAE Standard J1383 specifies certain photometric requirements, including luminous intensity requirements, for vehicular lamps functioning as headlamps.

[0005] The Department of Transportation (DOT), in its Federal Motor Vehicle Safety Standards, 49 C.F.R. §571.108 (2000), ("FMVSS 108") regulates all lamps, reflective devices, and associated equipment. FMVSS 108 can be found at www.nhtsa.dot.gov and is hereby incorporated by reference in its entirety. DOT Standard 1383 (part of FMVSS108) adopts the Society of Automotive Engineers (SAE) Standard J1383 (December 1996) for motor vehicle headlamps.

[0006] SAE Standard J1383 defines a headlamp as a "lighting device providing an upper and/or lower beam designed to provide illumination forward of the vehicle." SAE Standard J1383 further defines a sealed beam headlamp assembly as "a headlamp assembly which includes one or more sealed beam headlamps." A low beam is a "beam intended to illuminate the road ahead of a vehicle when meeting or following

another vehicle." A high beam is a "beam intended primarily for distant illumination for use when not meeting or following other vehicles." SAE Standard J1383 also requires that the color of the emanating light produced by a headlamp shall be white as defined in SAE Standard J578.

[0007] SAE Standard J1383 also specifies certain requirements for vehicular lamps functioning as headlamps, including minimum and/or maximum luminous intensity requirements. According to the aforementioned standards, a minimum and/or maximum luminous intensity must exist at various points in the illumination zone to be in compliance. These specific photometric requirements for vehicular low beam and high beam headlamps, as set forth in SAE Standard J1383, are included hereinbelow.

Table 1: PHOTOMETRIC SPECIFICATION - LOW BEAM

Low Beam	Minimum (cd)	Maximum (cd)
10U to 90U, 45^0 R to 45^0 L		125
8L to 8 R, H to 4U	64	
4L to 4R, H to 2U	125	
1U to 1-1/2 L to L		700
1/2U to 1-1/2L to L		1000
1/2D to 1-1/2L to L		3000
1-1/2U to 1R to R		1400
1/2U to 1R, 2R, 3R		2700
1/2D to 1-1/2R	8000	20000
1D to 6L	750	
1-1/2D to 2R	15000	
1-1/2D to 9L and 9R	750	
2D to 15L and 15R	700	
4D to 4R		8000

Table 2: PHOTOMETRIC SPECIFICATION - HIGH BEAM

High Beam	Minimum (cd)	Maximum (cd)
2U to V	1500	
1U to 3R and 3L	5000	
H to V	20000	75000

	H to 3R and 3L	10000	
	H to 6R and 6L	3250	
	H to 9R and 9L	2000	
	H to 12R and 12L	500	
5	1-1/2D to V	5000	
	1-1/2D to 9R and 9L	1500	
	2-1/2D to V	2000	
	2-1/2D to 12R and 12L	750	
	4D to V		12500
10	Maximum Beam Candela[1]	30000	

1. The highest candela reading found in the beam pattern

[0008] SAE J578, entitled "Color Specification", sets forth the definition for white light as applied to headlamps. The definition applies to the overall effective color of light emitted by a headlamp in any given direction and not to the color of the light from a small area of the lens. In SAE J578, the fundamental requirements for color are expressed as chromaticity coordinates according to the CIE (1931) standard colorimetric system.

[0009] Pursuant to SAE J578, the following requirements for white light shall apply when measured by the tristimulus or spectrophotometric methods, as are well known in the art.

Table 4: WHITE LIGHT (ACHROMATIC)

The color of light emitted from the headlamp shall fall within the following boundaries:
$x = 0.31$ (blue boundary)
$x = 0.50$ (yellow boundary)
$y = 0.15 + 0.64x$ (green boundary)
$y = 0.05 + 0.75x$ (purple boundary)
$y = 0.44$ (green boundary)
$y = 0.38$ (red boundary)

[0010] SAE J1383 standard and SAE J578 standard can also be found at www.sae.com and are hereby incorporated by reference in their entirety, as is FMVSS 108, 49 C.F.R. §571.108 (2000).

[0011] As mentioned above, one embodiment of the subject invention relates to a headlamp quad assembly that incorporates four (4) individual headlamps (i.e. 2 low beam lamps and 2 high beam headlamps). In this embodiment, each individual headlamp is a four (4) inch by six (6) inch, rectangular sealed-beam lamp. In an alternate embodiment, a dual headlamp assembly incorporates two (2) combined, high/low beam headlamps, wherein each individual headlamp is a seven (7) inch round sealed-beam lamp. In still another embodiment of the two-lamp assembly, each individual headlamp is a five (5) inch by seven (7) inch rectangular sealed-beam lamp. In each of the embodiments, the individual lamps forming a headlamp assembly emit white light (as defined above).

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Figure 1 is a diagrammatic, front-end view of a heavy-duty vehicle provided with a light emitting diode headlamp assembly according to one embodiment of the present invention.

[0013] Figure 2 is an exploded perspective view of a low beam headlamp according to one embodiment of the present invention.

[0014] Figure 3 shows a vertical cross section of the low beam headlamp in Figure 2.

[0015] Figures 4A-4C illustrate a cross-sectional, perspective and plan view, respectively, of a reflector subassembly according to one embodiment of the present invention.

[0016] Figure 5A illustrates a vertical cross-sectional view of inner and outer light transmissive members according to one embodiment of a low beam headlamp.

[0017] Figure 5B illustrates a longitudinal cross-sectional view of inner and outer light transmissive members according to one embodiment of the low beam headlamp.

[0018] Figures 5C-5D illustrate a perspective and top plan view of the inner light transmissive member shown in Figures 5A-5B.

[0019] Figure 6 shows a rear plan view of the outer light transmissive member for the low beam headlamp shown in Figures 1-2.

[0020] Figures 7A-7F illustrate partial longitudinal and vertical cross-sections of the optical surfaces formed on the outer light transmissive member shown in Figure 6.

[0021] Figure 8 illustrates a longitudinal cross-sectional view of inner and outer light transmissive members according to one embodiment of the high beam headlamp illustrated in Figure 1.

[0022] Figure 9 shows a rear plan view of the outer light transmissive member for the high beam headlamp illustrated in Figure 1.

[0023] Figures 10A-10B show partial longitudinal and vertical cross-sections of the optical surfaces formed on the outer light transmissive member shown in Figure 9.

[0024] Figures 11A-11C illustrate a top plan view, bottom plan view and cross-sectional view, respectively, of the housing in one embodiment of the headlamp assembly.

[0025] Figure 12 illustrates one embodiment of the drive circuit in one embodiment of the headlamp assembly.

[0026] Figure 13A illustrates the manner in which the reflector subassembly and inner light transmissive member direct light emitted from the light emitting diodes.

[0027] Figure 13B illustrates the manner in which the outer light transmissive member in a high beam headlamp directs light.

[0028] Figure 14 is a diagrammatic, top plan view of the vehicle in Figure 1.

[0029] Figures 15A-15B illustrate the light pattern created on an imaginary surface.

[0030] Figures 16A-C illustrate an alternate embodiment of the invention, a 7-inch round combined low/high beam headlamp.

DETAILED DESCRIPTION OF ~~THE DRAWINGS~~ EMBODIMENTS OF THE INVENTION

[0031] For the purpose of promoting an understanding of the present invention, references are made in the text hereof to embodiments of a low beam and high beam light emitting diode headlamp and headlamp assembly, some of which are illustrated in the drawings. It is nevertheless understood that no limitations to the scope of the invention are thereby intended. One of ordinary skill in the art will readily appreciate that modifications such as these involving the shape of the low and high beam headlamps, type or number of light emitting diodes, number of reflector units, or type and placement of optical elements of the lens, do not depart from the spirit and scope of the present invention. Some of these possible modifications are mentioned in the following description. In the embodiments depicted, like reference numerals refer to identical structural elements in the various drawings.

[0032] Figure 1 is a diagrammatic, front-end view of a heavy-duty vehicle 1 provided with a preferred embodiment of the present invention, namely a sealed beam headlamp assembly 4 that uses light emitting diodes as a light source. In the embodiment shown here, headlamp assembly 4 is a four (4) inch by six (6) inch, quad headlamp package. Accordingly, as shown here, headlamp assembly 4 comprises four individual sealed headlamps: two (2) low beam headlamps 70 and two (2) high beam headlamps 170, each of the four individual headlamps utilizing light emitting diodes as a light source. In this embodiment, the low and high beam headlamps are identical, except for the outer lens that distributes the light appropriately to satisfy the SAE requirements.

[0033] In the embodiment shown in Figure 1, and as described herein, headlamps 70 function as low beam headlamps that satisfy the photometric, dimensional, color and other requirements for low beam headlamps as set forth in SAE Standard J1383. Similarly, headlamps 170 function as high beam headlamps that satisfy the photometric, dimensional, color and other requirements for high beam headlamps as set forth in SAE Standard J1383. For example, in the embodiment shown here, low beam headlamps 70 and high beam headlamps 170 are rectangular in shape and approximately four (4) inches by six (6) inches to comply with the dimensional requirements of SAE Standard J1383. One of ordinary skill in the art will readily appreciate, however, that a sealed-beam headlamp assembly according to the instant invention can also comprise combined low/high beam headlamps with alternate shapes and/or dimensions and still comply with SAE Standard J1383. For example, in one alternate embodiment, a headlamp assembly utilizes two combined low beam/high

beam headlamps that are round in shape with a seven (7) inch diameter (see Figures 16A-C). Alternatively, the headlamp assembly utilizes two combined low beam/high beam headlamps that are rectangular in shape and approximately five (5) inches by seven (7) inches (not shown).

[0034] Moreover, the overall effective color of light emitted by low beam headlamps 70 and high beam headlamps in any given direction is white to satisfy SAE Standard J1383. As indicated hereinabove, SAE Standard J578 expresses the fundamental requirements for white light as chromaticity coordinates according to the CIE (1931) standard colorimetric system (see Tables 3-4 above).

[0035] Referring further to Figure 1, in an embodiment of the quad headlamp assembly, two (2) headlamps 70 are operatively arranged as the two outer headlamps of headlamp assembly 4 to perform the low beam function and two (2) headlamps 170 are operatively arranged as the two inner headlamps of headlamp assembly 4 to perform the high beam function. Referring further to Figure 1, each low beam headlamp 70 and each high beam headlamp 170 is a separate unit with a separate housing that is mounted individually to the front end of vehicle 1, thereby forming headlamp assembly 4. However, in alternate embodiments of the invention, headlamp assembly 4 can comprise low beam headlamp 70 and high beam headlamp 170 as separate units that are joined together prior to mounting or each pair of low beam headlamp 70 and high beam headlamp 170 can share a single housing. The method and manner of mounting headlamp assembly 4 to vehicle 1 are well known to one of ordinary skill in the art.

[0036] Figure 2 is an exploded perspective view of an individual low beam headlamp 70. Low beam headlamp 70, in this embodiment of the invention, is

comprised of a housing 6, a reflector subassembly 11, a plurality of high-flux light emitting diodes 12, an outer light transmissive member 13, and a planar substrate 9. Headlamp 70 further comprises a plurality of inner light transmissive members 17, disposed behind outer light transmissive member 13 (and, therefore, not shown here). A drive circuit 5, discussed in more detail hereinbelow, is also provided for headlamp 70.

[0037] In Figure 2, headlamp 70 is shown to include a total of six (6) high-flux light emitting diodes 12. In this embodiment, light emitting diodes 12 ~~preferably~~ are configured in a two-dimensional array having two horizontal rows and three vertical columns to create a 2 x 3 matrix. In this ~~preferred~~ embodiment, light emitting diodes 12 are mounted on planar substrate 9 with their primary axis horizontal to the ground and parallel with the longitudinal axis of vehicle 1, such that the light emitted from each of light emitting diodes 12 is directed away from planar substrate 9. In an alternate embodiment of a combined high/low beam headlamp, light emitting diodes 12 are configured in a circular pattern and mounted on a circular planar substrate (See Figure 16C).

[0038] In all of the embodiments disclosed herein, a high-flux light emitting diode is defined as a light emitting diode capable of producing a minimum flux of at least 50-55 lumens, and an average flux of approximately 70 lumens. For example, but not intending to be limiting, a plurality of 3-Watt Luxeon™ Lambertian-style light emitting diodes, manufactured by LumiLeds Lighting B.V., are used ~~in a preferred embodiment~~.

[0039] Figure 3 shows a cross section along axis A-A (see Figure 2) of low beam headlamp 70. Referring to Figure 3, headlamp 70 includes housing 6 and outer light

transmissive member 13. In this embodiment, and as will be described in more detail below, outer light transmissive member 13 is a lens with at least one optical surface for directing light emitted from light emitting diodes 12. Outer light transmissive member 13 also functions to form a cover for housing 6, defining a three-dimensional space 7 therebetween. In ~~a preferred~~ the embodiment shown in Figure 3, outer light transmissive member 13 is hermetically sealed to housing 6 with an adhesive that additional functions as a sealant. For example, one of ordinary skill in the art will readily appreciate that RTV silicone or urethane can be used as the adhesive.

[0040] Referring further to Figure 3, headlamp 70 again is shown to comprise reflector subassembly 11, high-flux light emitting diodes 12, and planar substrate 9. Headlamp 70 is also shown to include a plurality of inner light transmissive members 17 fixedly secured to light transmissive member 13.

[0041] In Figure 3, it can be seen that light emitting diodes 12 are disposed at the base of reflector subassembly 11 and mounted to planar substrate 9. Planar substrate 9 is a circuit board in the embodiment shown here. More specifically, planar substrate 9 is an aluminum core circuit board that is mounted directly on housing 6.

[0042] In alternate embodiments, planar substrate 9 can be a conventional circuit board. In such an embodiment (not shown), light emitting diodes 12 are secured to planar substrate 9 via mounting posts with heat transfer properties, wherein the mounting posts correspond to holes in planar substrate 9. Such a mounting method is described in U.S. Patent No. 5,857,767 (Hochstein), U.S. Patent No. 6,428,189 (Hochstein) and U.S. Patent 6,582,100 (Hochstein). In still another embodiment, a very thin Fiberglass Reinforced Polyester circuit board can be used as planar substrate 9,

which would provide adequate heat transfer away from light emitting diodes 12 and, thereby, eliminate the need for an aluminum circuit board or mounting posts.

[0043] Figure 4A illustrates a cross-sectional view of reflector subassembly 11. Figure 4B illustrates a perspective view of reflector subassembly 11. Figure 4C illustrates a top planar view of reflector subassembly 11. In the embodiment shown in Figures 4A-4C, reflector subassembly 11 is a unitary reflector subassembly. Reflector subassembly comprises a plurality of reflector units 11*a* arranged in a plurality of rows. Each individual reflector unit 11*a* has an aperture 26, which corresponds to one light emitting diode 12. Specifically, reflector subassembly comprise six (6) reflector units 11*a* forming a 2 x 3 array such that each individual reflector unit 11*a* corresponds to an individual light emitting diode 12. In an alternate embodiment of a combined high/low beam headlamp, reflector subassembly combines fourteen (14) individual reflector units forming a circular arrangement such that each individual reflector unit corresponds to one of fourteen (14) individual light emitting diodes (see Figures 16A-C).

[0044] In ~~a preferred~~ the embodiment shown, each individual reflector unit 11*a* is a parabolic revolution with a 6 mm focal length. More specifically, but not intended to be limiting, in the embodiment shown here, distance G-G is approximately 44 mm; distance [[H-H]] F-F is approximately 44 mm, and each aperture 26 has a diameter of 24 mm. More generally, each reflector unit 11*a* collects and collimates a portion of the light emitted from the corresponding light emitting diode 12 (see Figure 13A). The resulting light rays are substantially parallel to the longitudinal axis of the lamp and directed toward ~~said~~ the outer light transmissive member (not shown in Figures 4A-4C).

[0045] In ~~a most preferred~~ the embodiment shown, reflector subassembly 11 is constructed of a metalized thermoplastic material. Specifically, ~~in a preferred embodiment,~~ reflector subassembly 11 is a single piece of molded polycarbonate plastic that is subsequently metalized with aluminum. In alternate embodiments, reflector subassembly 11 can be constructed of a naturally reflective material, or can be coated with other reflective materials, such as white or silver paint. In addition, although the embodiment shown here depicts a unitary reflector subassembly with six reflector units, in an alternate embodiment each reflector unit 11*a* can be molded as a plurality of individual reflectors.

[0046] Figure 5A illustrates a cross section of outer light transmissive member 13 along vertical line A-A, as shown in Figure 2, and Figure 5B illustrates a cross section along longitudinal line B_2-B_2. As can be seen in Figures 5A-5B, light transmissive member 13 has an inner surface 21 and outer surface 22.

[0047] A plurality of annular extensions 20 corresponding to light emitting diodes 12 are integral to outer light transmissive member 13, extending laterally from inner surface 21 toward reflector subassembly 11. Each annular extension 20 functions as an alignment mechanism for an inner light transmissive member 17. In ~~a preferred~~ the embodiment shown, there are six (6) annular extensions 20 and six (6) inner light transmissive members 17, each corresponding to one of the six (6) light emitting diodes 12. Inner light transmissive members 17 are fixedly secured (as described below) to annular extensions 20 to maintain the correct position relative to [[a]] one (1) corresponding light emitting diode 12. More specifically, annular extensions 20 align ~~said~~ each inner light transmissive ~~members~~ member 17 relative to ~~said~~ one (1) light

emitting ~~diodes~~ diode 12 such that each ~~of said plurality of~~ inner light transmissive ~~members~~ member 17 is positioned substantially parallel to outer light transmissive member 13 and in front of [[a]] one (1) corresponding light emitting diode 12.

[0048] In alternate embodiments, other alignment mechanisms for light transmissive members 17 may be used. For example, although not shown, one could use three-legged extensions that laterally extend toward the reflector subassembly or disc-like extensions from the outer light transmissive member that laterally extend toward the reflector subassembly. In addition, one could use a plurality of annular extensions or three-legged extensions that lateral extend from the planar substrate (not shown).

[0049] Inner light transmissive members 17 are collimating lenses with a 24 mm back focal length. Figures 5c-5d illustrate a perspective and cross-sectional view of one light transmissive member 17, respectively. Each inner light transmissive member 17 captures the light rays that bypass reflector units 11a, and then concentrates and directs the captured light rays toward outer light transmissive member 13. More specifically, each inner light transmissive member 13 captures the light rays emitted in a cone extending approximately forty-four (44) degrees from a corresponding light emitting diode 12. In the embodiment shown here, each light transmissive member 17 is an aspheric lens that is operatively mounted to outer light transmissive member 13 *via* annular extensions 20. In ~~a preferred~~ one embodiment, each light transmissive member 17 is fixedly secured to an annular extension 20 *via* a snap-lock mechanism. In alternate embodiments, inner light transmissive members 17 can each be fixedly

secured to annular extensions 20 *via* ultrasonic welding, ultrasonic swaging, heat staking, or adhesives.

[0050] In one ~~preferred~~ embodiment, outer light transmissive member 13 is formed of a singularly molded piece of clear, polycarbonate plastic. Similarly, inner light transmissive members 17 are formed of a molded piece of clear, polycarbonate plastic.

[0051] Figure 6 shows a rear top plan view of outer light transmissive member 13 as provided in low beam headlamp 70. Referring to Figure 6, longitudinal axis of headlamp 70 is defined as line B_1- B_1, and vertical axis of headlamp 70 is defined as line A-A.

[0052] As can be seen ~~here~~, in this embodiment outer light transmissive member 13 is a lens with a plurality of individual prism optics 25*a,b,c* forming a rectangular array on inner surface 21. By varying the radius, curvature, or thickness of the individual prism optics 25*a,b,c*, different desired light patterns can be achieved to satisfy the photometric and luminescence requirements for low beam headlamps as set forth in SAE Standard J1383. For example, in the ~~preferred~~ embodiment shown in Figure 6, outer light transmissive member 13 has three distinct optical surfaces formed on inner surface 21. The upper portion above longitudinal axis B_1- B_1 has optical surface 80 and optical surface 81, and the lower portion below longitudinal axis B_1- B_1 has optical surface 90. In general, optical surface 80 uniformly spreads the light in the horizontal direction at a wide angle, approximately 25-30 degrees left and right of vertical axis A-A. Optical surface 81 spreads the light horizontally in a narrow pattern and vertically, to produce a light pattern approximately eight (8) degrees left to eight (8) degrees right of vertical axis A-A and approximately zero (0) degrees to four (4) degrees up from

longitudinal axis B_1- B_1. Finally, optical surface 90 spreads the light both vertically and horizontally, to produce a light pattern approximately two (2) degrees down from longitudinal axis B_1- B_1 and approximately two (2) degrees right of vertical axis A-A. In this way, optical surface 90 produces a high intensity area below and to the right of center as required by SAE Standard J1383.

[0053] More specifically, but not intending to be limiting, in the ~~preferred~~ embodiment shown in Figure 6, optical surface 80 comprises a plurality of prism optics 25*a*; optical surface 81 comprises a plurality of prism optics 25*b*; and optical surface 90 comprises a plurality of prism optics 25*c*.

[0054] In Figure 7A, a portion of optical surface 80 is shown in longitudinal cross-sectional view (along line B_3- B_3). Prism optics 25*a* preferably have a longitudinal cross sectional profile that is generally convex toward light emitting diodes 12. More specifically, as shown here, the longitudinal cross section of prism optics 25*a* has a radius of curvature that is approximately 2.804 mm. In Figure 7B, a portion of optical surface 80 is shown in vertical cross-sectional view (along line A-A). ~~As~~ In the embodiment shown here, prism optics 25*a* ~~preferably~~ have a vertical cross-sectional profile that is generally linear with a decline angle *m* equivalent to approximately 2.950 degrees down from the horizontal. One of ordinary skill in the art will readily appreciate, however, that the vertical and longitudinal cross section of prism optics 25*a* may each have any suitable radius of curvature or degree of decline such that the light is distributed approximately 25-30 degrees to the left and right of vertical axis A-A.

[0055] In Figure 7C, a portion of optical ~~section~~ surface 81 is shown in longitudinal cross-sectional view (along line B_3- B_3). Prism optics 25*b* preferably have a

longitudinal cross sectional profile that is generally convex toward light emitting diodes 12. More specifically, in the embodiment shown here, the longitudinal cross section of prism optics 25*b* has a radius of curvature that is approximately 7.182 mm. In Figure 7D, a portion of optical ~~section~~ surface 81 is shown in vertical cross-sectional view (along line A-A). Prism optics 25*b* ~~preferably~~ have a vertical cross sectional profile that is generally convex toward light emitting diodes 12. More specifically, in the embodiment shown here, the vertical cross section of prism optics 25*b* has a radius of curvature that is approximately 31.965 mm. One of ordinary skill in the art will readily appreciate, however, that the vertical and longitudinal cross section of prism optics 25*b* may each have any suitable radius of curvature such that the light is distributed approximately eight (8) degrees left to eight (8) degrees right of vertical axis A-A and approximately zero (0) degrees to four (4) degrees up from longitudinal axis B_1- B_1.

[0056] In Figure 7E, a portion of optical surface 90 is shown in longitudinal cross-sectional view (along line B_2- B_2). Prism optics 25*c* preferably have a longitudinal cross sectional profile that is generally concave toward light emitting diodes 12 with an incline angle *k* equivalent to approximately 2.950 degrees up from the horizontal. More specifically, in the embodiment shown here, the longitudinal cross section of prism optics 25*c* has a radius of curvature that is approximately 30.000 mm. In Figure 7F, a portion of optical surface 90 is shown in vertical cross-sectional view (along line A-A). In the embodiment shown here, prism optics 25*c* preferably have a vertical cross-sectional profile that is generally linear with an incline angle *j* equivalent to approximately 2.592 degrees up from the horizontal. One of ordinary skill in the art will readily appreciate, however, that the vertical and longitudinal cross section or prism

optics 25c may each have any suitable radius of curvature or degree of incline such that the light is distributed approximately two (2) degrees down from longitudinal axis B_1- B_1 and approximately two (2) degrees right of vertical axis A-A.

[0057] As described hereinabove, in ~~a preferred~~ the embodiment shown, headlamp assembly 4 comprises two high beam headlamps 170 in addition to two (2) low beam headlamps 70 (see Figure 1). In general, high beam headlamp 170 comprises the same components as low beam headlamp 70[[;]], namely, [[a]] housing 6, [[a]] reflector subassembly 11, a plurality of high-flux light emitting diodes 12, [[a]] planar substrate 9, a plurality of inner light transmissive members 17, and [[a]] drive circuit 5. However, rather than an outer light transmissive member 13 as disclosed ~~hereinabove~~ supra, each high beam headlamp 170 comprises an outer light transmissive member 113 as described ~~hereinbelow~~ infra.

[0058] Figure 8 illustrates a longitudinal cross-sectional view of light transmissive member 113 along line X_2-X_2 (see Figure 9) as provided in an individual high beam headlamp 170. As can be seen in Figure 8, light transmissive member 113 has an inner surface 121 and outer surface 122. Similar to light transmissive member 13, a plurality of annular extensions 20 corresponding to light emitting diodes 12 extends from inner surface 121. Annular extensions 20 are support mechanisms for the plurality of inner light transmissive members 17 in the same manner described above in connection with headlamp 70.

[0059] Figure 9 shows a rear top plan view of outer light transmissive member 113. Referring to Figure 9, longitudinal axis of headlamp 170 is defined as line X_1-X_1, and vertical axis of headlamp 170 is defined as line Y-Y.

[0060] As can be seen here, ~~in a preferred embodiment of~~ high beam headlamp 170[[,]] is comprised of light transmissive member 113 is a lens with a plurality of optical elements formed on inner surface 121. Specifically, and referring to Figure 9, inner surface 121 comprises four distinct optical surfaces 180, 181, 190, 191. Optical surfaces 180, 181, 190, 191 function as converging, or focusing, lenses to satisfy the photometric and luminescence requirements for high beam headlamps as set forth in SAE Standard J1383. In this embodiment for a high beam headlamp, optical surfaces 180, 181, 190, 191 are linear prisms with a conic cross section, whereby each prism is convex toward light emitting diodes 12 to function as a convergent optic.

[0061] For example, referring ~~back~~ again to Figure 8, ~~a preferred~~ one embodiment of optical surfaces 180, 181, and 190 is illustrated. As shown ~~here~~, optical surface 180 ~~preferably~~ has a conic cross-sectional profile that is convex toward light emitting diodes 12. Portions of optical surface 180 disposed inside annular extensions 20 collect collimated light rays from the corresponding inner light transmissive member 17 and uniformly distribute the light rays in a horizontal direction, approximately six (6) degrees left and right of longitudinal axis X_1-X_1. Additionally, portions of optical surface 180 disposed outside annular extensions 20 collect collimated light rays from reflector subassembly 11 and also uniformly distribute the light rays approximately six (6) degrees left and right of vertical axis Y-Y ~~also~~.

[0062] In this ~~preferred~~ embodiment, but not intending to be limiting, optical surface 180 has radii of curvature that range from approximately 20 mm to 904 mm (a difference of 884 mm). However, one of ordinary skill in the art will readily appreciate

that optical surface 180 may have any suitable range of radii of curvature such that the light rays are distributed approximately six (6) degrees left and right of vertical axis Y-Y.

[0063] Referring further to Figure 8, optical surface 181 ~~preferably~~ has a conic cross-sectional profile that is convex toward light emitting diodes 12. Portions of optical surface 181 disposed inside annular extensions 20 collect collimated light rays from the corresponding inner light transmissive member 17 and uniformly distribute the light rays in a horizontal direction, approximately three (3) degrees left and right of vertical axis Y-Y. Additionally, portions of optical surface 181 disposed outside annular extensions 20 collect collimated light rays from reflector subassembly 11 and uniformly distribute the light rays approximately three (3) degrees left and right of vertical axis Y-Y.

[0064] In this ~~preferred~~ embodiment, but not intending to be limiting, optical section 181 has radii of curvature that range from approximately 48 mm to 842 mm (a difference of 794 mm). However, one of ordinary skill in the art will readily appreciate that optical surface 181 may have any suitable range of radii of curvature such that the light rays are distributed approximately three (3) degrees left and right of vertical axis Y-Y.

[0065] Referring further to Figure 8, optical surface 190 preferably has a conic cross-sectional profile that is conic toward light emitting diodes 12. Portions of optical surface 190 disposed inside annular extensions 20 collect collimated light rays from the corresponding inner light transmissive member 17 and uniformly distribute the light rays in a horizontal direction, approximately nine (9) degrees left and right of vertical axis Y-Y. Additionally, portions of optical surface 190 disposed outside annular extensions 20

collect collimated light rays from reflector subassembly 11 and uniformly distribute the light rays approximately nine (9) degrees left and right of vertical axis Y-Y.

[0066] In this ~~preferred~~ embodiment, but not intending to be limiting, optical section 190 has radii of curvature that range from approximately 7 mm to 821 mm (a difference of 814 mm). However, one of ordinary skill in the art will readily appreciate that optical surface 190 may have any suitable range of radii of curvature such that the light rays are distributed approximately nine (9) degrees left and right of vertical axis Y-Y.

[0067] Finally, in Figure 10A, optical ~~section~~ surface 191 is shown in longitudinal cross-sectional view (along line Z-Z) without light transmissive member 17 and, in Figure 10B, optical ~~section~~ surface 191 is shown in vertical cross-sectional view (along line V-V) with light transmissive member 17. Optical surface 191, disposed only within the bottom center annular extension 20, collects collimated light rays from the corresponding inner light transmissive member 17 and uniformly distributes the light rays in a horizontal direction, approximately fifteen (15) degrees left and right of vertical axis Y-Y. Additionally, referring to Figure 10B, optical surface 191 has a linear vertical cross-sectional profile with a decline angle *h* to distribute the light rays vertically approximately one (1) degree downward of longitudinal axis X_1-X_1.

[0068] In this ~~preferred~~ embodiment, but not intending to be limiting, optical section 190 has radii of curvature that range from approximately 23.09 mm to 44.20 mm (a difference of 21.11 mm). Moreover, in this ~~preferred~~ embodiment, decline angle *h* is equivalent to approximately 1.00 degree down from the horizontal. However, one of ordinary skill in the art will readily appreciate that optical surface 191 may have any

suitable range of radii of curvature, or decline angle *h*, such that the light rays are distributed approximately fifteen (15) degrees left and right and approximately one (1) degree downward.

[0069] In practice, when high beam headlamp 170 is switched on, low beam headlamp 70 remains on to supplement the high beam pattern. Low beam headlamp 70 provides supplemental light distribution below the horizontal, for example, 2.5 degrees down and 12 degrees left and right, to satisfy the SAE requirements J1383 for a high beam pattern.

[0070] Figure 11A illustrates a top plan view of housing 6 in ~~a preferred~~ one embodiment of low beam headlamp 70. Figure 11B illustrates a bottom plan view of one embodiment of housing 6, and Figure 11C illustrates a cross-sectional view of one embodiment of housing 6 along line D-D. In the ~~preferred~~ embodiments shown and described ~~hereinabove~~ supra, housing 6 functions as the heat sink. Accordingly, in the embodiment shown ~~here~~, housing 6 is made of a single piece of aluminum, either die cast or extruded. In an alternate embodiment, die cast zinc can be used for housing 6.

[0071] Housing 6 is exposed to the outside air, thereby allowing the heat transfer provided by housing 6 to be transferred to the air due to convection. In addition, as shown in Figures 11B-11C, a plurality of adjacent, vertically-oriented external cooling fins 16 are disposed on the bottom of housing 6 to enhance the transfer of the heat generated by light emitting diodes 12. In this way, the temperature of light emitting diodes 12 and space 7 are kept sufficiently cool to prevent degradation of the brightness of low beam headlamp 70. By preventing degradation of light emitting diodes 12, the

transfer of heat *via* external fins 16 aids headlamp assembly 4 in meeting the requirements of SAE J1383 and the legal criteria set forth in FMVSS 108.

[0072] In ~~a preferred~~ the embodiment shown, low beam headlamp 70 is also potted with an epoxy. This not only provides a greater heat sink and ability to withdraw thermal energy directly away from light emitting diodes 12, but also provides protection for light emitting diodes 12 and planar substrate 9 from vibration, fatigue, and moisture.

[0073] Additionally, housing 6 also provides a mechanism to mount low beam headlamp 70 onto vehicle 1, such as a truck, tractor and/or a truck trailer. Moreover, apertures 15 are found at the bottom of housing 6. Apertures 15 are function as exit points for electrical wires to connect to circuitry outside low beam headlamp 70. In ~~a preferred~~ the embodiment shown, low beam headlamp 70 has three (3) apertures 15. One of ordinary skill in the art will readily appreciate that apertures 15 can also be standard headlamp terminals and can be arranged in a number of ways. As discussed above, ~~planar~~ substrate 9 is disposed within space 7 and operatively mounted to housing 6. Although not shown here, in ~~a preferred~~ an alternate embodiment, housing 6 for high beam headlamp 170 has two apertures 15.

[0074] In an alternate embodiment (not shown), a separate heat sink 14 is utilized. In this embodiment, housing 6 can be made of a material that does not have heat transfer properties, such as polycarbonate plastic. Heat sink 14 is made of aluminum, either die cast or extruded, or any other material with similar heat transfer properties, such as die cast zinc. Heat sink 14 is operatively mounted to the base of housing 6 and planar substrate 9 is mounted to heat sink 14.

[0075] Figure 12 shows one embodiment of drive circuit 5~~, the drive circuit found in a most preferred~~ in one embodiment of headlamp assembly 4. ~~In a preferred embodiment of headlamp assembly 4~~ As can be seen, light emitting diodes 12, in both headlamp 70 and headlamp 170, are connected to a drive circuit 5 in series/parallel; i.e. three strings of two light emitting diodes 12. In this way, a failure of any one string will cause a reduction in light output, but not in the distribution of light.

[0076] ~~Drive~~ In an embodiment of drive circuit 5 found in headlamp assembly, drive circuit 5 is a current-regulating drive circuit with over-voltage protection. Referring to Figure 12, drive circuit 5 provides constant current to three (3) parallel strings of light emitting diodes for two (2) inputs (high/low beam) in the following manner. Drive circuit 5 comprises three of the below-described circuits – one for each parallel string of light emitting diodes. Current is regulated through a voltage range of approximately 9.5V to 16.0V. Current flows through either diode 33 for high beam input, or diode 34 for low beam input, and is filtered by capacitor 36 before input to low drop out (LDO) current regulators 35*a*, 35*b*, *35c*. LDO current regulators 35*a*, 35*b*, *35c* are enabled by a small current input. Current regulation is established in LDO current regulators 35*a*, 35*b*, *35c* by feedback resistor 38 located on the low side of the light emitting diode load. The resistor value of feedback resistor 38 determines current flow through the string of light emitting diodes and is filtered by capacitors 37*a*, 37*b*, *37c* on the output of LDO current regulators 35*a*, 35*b*, *35c*.

[0077] Referring further to Figure 12, as current returns to ground, it passes through HEXFET® switching device 39, which is enabled on/off by an over-voltage sensing circuit. When operating in designed voltage range, approximately 9.5 V-16.0 V,

HEXFET® switching device 39 is enabled on and will conduct. When the voltage exceeds upper design limit, a Zener diode sensing component conducts and causes a transistor to pull low (grounding) the gate of HEXFET® switching device 39. This action disables HEXFET® switching device 39 and disconnects the ground or (negative wire) from LDO current regulators 35*a*, 35*b*, 35*c* and load part of circuit 5. When the voltage returns to design voltage range, the above-described process reverses, turning the load and LDO current regulators 35*a*, 35*b*, 35*c* back on.

[0078] In the embodiment illustrated above, drive circuit 5 is mounted on ~~planar~~ substrate 9. However, in alternate embodiments, drive circuit 5 can be separate from ~~planar~~ substrate 9 or even disposed outside one or both of low beam headlamp 70 and high beam headlamp 170. ~~Although drive circuit 5, as described above, is a preferred embodiment,~~ One of ordinary skill in the art will recognize that alternate circuits with current regulation to protect the light emitting diodes ~~may~~ can be used. For example, a circuit that uses a switching power supply followed by a linear current regulator could be employed.

[0079] Figure 13A is a partial vertical cross-sectional view of one embodiment of low beam headlamp 70 that illustrates the manner in which light emitted from light emitting diodes 12 is directed by reflector units 11*a* and inner light transmissive members 17. ~~Figures~~ Figure 13B is a longitudinal cross-sectional view of outer light transmissive member 113 and inner light transmissive member 17 in high beam headlamp 170, illustrating the manner in which light received from inner light transmissive members 17 is directed by outer transmissive member 113.

[0080] Figure 14, a diagrammatic, top plan view of vehicle 1, illustrates the manner in which headlamp assembly 4 emits light beams in a longitudinal direction parallel to the longitudinal axis of vehicle 1. Figure 14 further illustrates an imaginary surface 8, upon which light beams are projected. Figures 15A-15B illustrate the light pattern emitted by low beam headlamp 70 and high beam headlamp 170, respectively, onto imaginary surface 8.

[0081] For each of the embodiments disclosed herein, the surfaces for reflector units 11*a* and outer light transmissive members 13, 113 were designed and/or constructed using a Non-Uniform Rational B-Splines (NURBS) CAD modeling program, Rhinoceros 2.0 (McNeel Associates, 2001), and the final design and documentation was performed using Unigraphics CAD system.

[0082] One of ordinary skill in the art will readily appreciate that a variety of low beam and high beam headlamp arrays and arrangements are within the scope of this invention. For example, by selectively turning on portions of the light emitting diode headlamp assembly, it is possible to vary the light output to produce not only a high or low beam, but also a fog light or auxiliary high beam or driving light.

[0083] In addition, alternate light distribution patterns can be used. As the lumen output of LEDs increases as a result in technological improvements, the additional output can be dispersed in directions that satisfy aesthetic or customer-specific light patterns, but that still meet legal and SAE standards.

[0084] Moreover, in an alternate embodiment of a light emitting diode headlamp assembly according to the invention, a pair of combined low/high beam headlamps comprising a plurality of light emitting diodes as a light source can be utilized. Figures

16A-B illustrate reflector subassembly 211 in an alternate embodiment of the invention, namely a 7-inch round combined high/low beam headlamp 270. In this embodiment, two headlamps 270 would be used to form a light emitting diode headlamp assembly according to the invention.

[0085] Referring to Figures 16A-B, reflector subassembly 211 combines twelve (12) individual reflector units 211*a* forming a circular arrangement such that each individual reflector unit 211*a* corresponds to one of twelve (12) individual light emitting diodes 212. As in the previously disclosed embodiments, reflector units 211*a* are parabolic reflectors. Approximately six (6) or seven (7) of light emitting diodes 212 are utilized to produce a low beam pattern for the headlamp assembly. The remainder, approximately six (6) or seven (7) of light emitting diodes 212 are utilized to produce a high beam pattern for the headlamp assembly, all in a single headlamp unit. Figure 16C illustrates the corresponding circular arrangement of light emitting diodes 212 on a circular planar substrate 209.

[0086] In still another embodiment (not shown), a reflector subassembly combines twelve (12) individual reflector units forming a circular arrangement such that each individual reflector unit corresponds to one of twelve (12) individual light emitting diodes. Moreover, the size and shape of the combined high/low beam headlamp embodiments can vary. For example, the combined low/high beam headlamp can be rectangular, comprising a 2 x 5 array of light emitting diodes and a corresponding 2 x 5 array of parabolic reflector units forming a reflector subassembly. Again, approximately five or six of light emitting diodes are utilized to produce a low beam pattern for the

headlamp assembly. The remainder, approximately five (5) or six (6), of light emitting diodes are utilized to produce a high beam pattern.

[0087] Although, for convenience, the invention has been described primarily with reference to specific embodiments, it will be apparent to those of ordinary skill in the art that the mirror assembly and the components thereof can be modified without departing from the spirit and scope of the invention as claimed.

[ABSTRACT] ABSTRACT

[00878] ~~The present invention is a~~ A light emitting diode headlamp ~~and headlamp assembly. The light emitting diode headlamp assembly is~~ capable of low beam and high beam functions. The light emitting diode headlamp assembly comprises high-flux light emitting diodes, a reflector subassembly, a first and second light transmissive member, and a heat sink.